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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* LUDWIG STEINHAUSER

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Appeal No. 2009-005986  
Application 10/540,226  
Technology Center 1700

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Decided: April 16, 2010

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Before BRADLEY R. GARRIS, CHUNG K. PAK, and  
CHARLES F. WARREN, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's decision finally rejecting claims 9 through 21, and 26, which are all of the claims pending in the above-identified application. *See* page 2 of the Appeal

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Brief (“App Br.”) filed May 15, 2008<sup>1</sup>. We have jurisdiction under 35 U.S.C. §§ 6 and 134.

#### STATEMENT OF THE CASE

The subject matter on appeal is directed to “a process for the production of half-tubes or tubes of a metallic, high-temperature-resistant material with a plurality of openings passing through their surface, for the fabrication of heat exchanger tubes for recuperative waste gas heat exchangers” (Spec. 1, ll. 1-5). Details of the appealed subject matter are recited in representative claim 9 reproduced from the Claims Appendix to the Appeal Brief as shown below:

9. A process for producing one of (a) half-tubes and (b) a tube of a metallic, high-temperature-resistant material with a plurality of openings passing though a surface of the one of (a) the half-tubes and (b) the tube for fabricating heat-exchanger tubes for a recuperative waste gas heat exchanger, comprising:

forming a model, destroyable by heat, of each of the one of (a) the half-tubes and (b) the tube;

forming a mold shell by finishing with a conventional gate system and immersion of the model in a ceramic coating composition and sanding with a cast shell ceramic material, alternating in several cycles;

melting-out of the model from the mold shell;

hardening the mold shell by firing;

producing a melt from the metallic, high-temperature-resistant material;

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<sup>1</sup> The Supplemental Appeal Brief (“Supp. App. Br.”) was filed June 17, 2008 to provide only a revised “Summary of Claimed Subject Matter” section in response to the Notification of Non-Compliant Appeal Brief dated May 22, 2008.

casting the melt in the mold shell one of (a) by applying a vacuum and (b) under excess pressure of an inert gas;

removing, after solidification of the melt, the one of (a) the half-tubes and (b) the tube from the mold by destroying the mold shell;

cleaning and trimming the one of (a) the half-tubes and (b) the tube and removing a sprue; and

post-treating, as necessary, the openings passing through the surface of the one of (a) the half-tubes and (b) the tube by one of (a) spark erosion and (b) blasting with an abrasive blasting agent.

As evidence of unpatentability of the claimed subject matter, the Examiner relies on the following prior art references at pages 2 and 3 of the Answer (“Ans.”) dated August 18, 2008 and page 2 of the Miscellaneous Communication dated August 28, 2008:

King, Jr.	3,895,672	Jul. 22, 1975
Ostrowski	4,223,716	Sep. 23, 1980
Wilkinson	4,321,010	Mar. 23, 1982
Wunder	4,589,478	May 20, 1986
Chandley	5,299,619	Apr. 5, 1994
Ottenschlaeger	5,600,950	Feb. 11, 1997

Appellant’s admission at pages 1 through 4 of the Specification (hereinafter referred to as “the admitted prior art”).

Appellant requests review of the following grounds of rejection<sup>2</sup> set forth in the Answer:

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<sup>2</sup> Appellant does not question or challenge the Examiner’s statements at page 3 of the Answer that the admitted prior art is included in the grounds of rejection directed to claims 10 and 16.

- 1) Claims 9, 11 through 15, 17 through 21, and 26 under 35 U.S.C § 103(a) as unpatentable over the combined teachings of the admitted prior art, any one of Wilkinson, Wunder or Ottenschlaeger, and Chandley;
- 2) Claim 10 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of the admitted prior art, any one of Wilkinson, Wunder or Ottenschlaeger, Chandley, and Ostrowski; and
- 3) Claim 16 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of the admitted prior art, any one of Wilkinson, Wunder or Ottenschlaeger, Chandley, and King, Jr. (App. Br. 3).

Appellant traverses the Examiner's § 103(a) rejections, arguing that one of ordinary skill in the art would not have been led to employ the claimed conventional high precision casting process for making metallic, high-temperature-resistant half-tubes or tube having a plurality of openings useful for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger within the meaning of 35 U.S.C. § 103(a) (App. Br. 4-8). In support of this argument, Appellant contends that the conventional investment casting method taught by either Wilkinson, Wunder or Ottenschlaeger, as explained by Chandley, is not directed to forming the claimed half-tubes or tube having a myriad of openings as explained at page 2 of the Specification, is not used for the reasons contemplated by Appellant, and does not include the claimed post-treatment step (App. Br. 4-7).

## ISSUES AND CONCLUSIONS

The first dispositive question is: Would one of ordinary skill in the art have been led to employ the claimed conventional investment (precision) casting method taught by either Wilkinson, Wunder or Ottenschlaeger, as

explained by Chandley, corresponding to the claimed process steps for making metallic, high-temperature-resistant half-tubes or tube having a plurality of openings useful for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger within the meaning of 35 U.S.C. § 103(a)? On this record, we answer this question in the affirmative.

The second dispositive question is: Has the post-treatment step recited in claim 9 written as an optional step in the claimed process for forming a metallic, high-temperature-resistant half-tubes or tube having a plurality of openings useful for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger? On this record, we answer this question in the affirmative.

#### RELEVANT FACTUAL FINDINGS

The following relevant factual findings are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office):

1. Appellant does not dispute the Examiner's finding that it was admittedly well known at the time of the invention to produce half-tubes or a tube of a metallic, high temperature-resistant material with a plurality of openings passing through a surface of the half tubes or the tube for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger used in gas turbine plants. (*Compare* Ans. 3-4 with App. Br. 3-8; *see also* Spec. 1-3.)
2. Appellant does not dispute the Examiner's finding that the admittedly known process for producing such half-tube or tube involves initially forging half-tubes or a tube of a metallic, high temperature-resistant material

and making a plurality of openings in the forged half-tubes or tube with electrodischarge machining (EDM). (*Compare Ans. 3-4 with App. Br. 3-8; see also Spec. 2-3.*)

3. Appellant acknowledges that the use of the EDM to form a myriad of openings in the forged half-tubes or tube used for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger was known to be “extremely cost-intensive,” “time-consuming” and problematic in terms of forming recast layers detrimental to soldering. (*See Spec. 2-3 and Compare Ans. 3 with App Br. 3-8.*)

4. Appellant does not dispute the Examiner’s finding that Wilkinson, Wunder, or Ottenschlaeger teaches a conventional investment (precision) casting process for forming tubes having a plurality of openings, without using an EDM step for forming the openings. (*Compare Ans. 4 with App. Br. 3-8.*)

5. Wilkinson teaches employing a conventional lost wax investment casting process to produce a unitary cast structure of a ceramic material corresponding to the claimed high temperature-resistant metallic material comprising a hollow aerofoil member and a cooling air entry tub having a plurality of small apertures as a blade or vane structure for a gas turbine engine (Abstract, col. 2, l. 9 to col. 5, l. 14 and Fig. 3).

6. Appellant acknowledges that Wunder teaches advantageously employing an investment casting to cast a tubular heat exchanger shell body having “the number of parts of different sizes and orientations protruding” therefrom (App. Br. 5).

7. Wunder also teaches that the tubular heat exchanger shell body cast also has a long internal cylindrical bore (39), annular recesses (43 and 44),

and openings and passages (18, 19, 21 35, 32, and 38) (col. 2, l. 30 to col. 3, ll. 29 and Figs. 1 and 2).

8. Ottenschlaeger teaches employing lost wax (precision) casting to produce pipe segments having projections (6) with screw holes (7) and opening (4) in a cost efficient manner for their use as an exhaust gas pipe for charged multi-cylinder internal combustion engines, without any additional costs associated with making screw holes separately (col. 1, ll. 52-56, col. 2, ll. 40-67 and Figs. 1 and 4).

9. Chandley explains that a known lost wax investment casting of high temperature-resistant metallic alloys or ceramic materials is carried out in the presence of an inert gas to avoid oxidation. (*See* col. 4, l. 47 to col. 8, l. 44; *Compare* Ans. 4 with App. Br. 3-8).

9. Appellant does not argue that the conventional lost wax investment (precision) process taught by Wilkinson, Wunder, or Ottenschlaeger, as further explained by Chandley, does not include all the casting process steps recited in claim 1, with the exception of the claimed optional post treatment step (App. Br. 3-8).

10. In fact, Appellant acknowledges that the present invention lies in employing a known high-precision casting process for producing the claimed half-tubes or tubes (Spec. 4).

11. Appellant does not proffer any objective evidence to show that one of ordinary skill in the art would not have reasonably expected to employ the known lost wax investment (high-precision) casting process to cast or produce the claimed half-tubes or tube (App. Br. 3-8).

12. Appellant does not dispute the Examiner's determinations at page 5 of the Answer that:

It would have been obvious to perform the dewax step in an autoclave [as required by claim 10] in view of Ostrowske who shows that feature to be conventional.

....

It would have been obvious to preheat shell mold prior to pouring of molten metal to prevent molten metal from premature solidification [as required by claim 16] in view of King, Jr. et al who show that feature to be conventional.

[(Compare Ans. 5 with App. Br. 7-8.)]

## PRINCIPLES OF LAW

The Supreme Court in *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 417-18 (2007) instructs us that:

[A]nalysis [of whether the subject matter of a claim would have been obvious under § 103] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can *take account of the inferences and creative steps that a person of ordinary skill in the art would employ*. [Emphasis added.]

*See also In re Bozek*, 416 F.2d 1385, 1390 (CCPA 1969) (“Having established that this knowledge was in the art, the examiner could then properly rely, as put forth by the solicitor, on a conclusion of obviousness ‘from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference.’”). The common knowledge attributable to one of ordinary skill in the art includes what was admittedly known in the art by Appellants at the time of the invention. *See In re Nomiya*, 509 F.2d 566, 570-71 (CCPA 1975) (The admitted prior art in applicant’s Specification may be used in determining the patentability of a claimed invention.); *see also In re Davis*, 305 F.2d 501, 503 (CCPA 1962).

The Supreme Court also instructs us that:

When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product . . . of ordinary skill and common sense.

*KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. at 421.

## ANALYSIS

### I. CLAIMS 9, 11 THROUGH 15, 17 THROUGH 21, AND 26

Appellant does not dispute the Examiner's finding that it was admittedly well known at the time of the invention to produce half-tubes and a tube of a metallic, high temperature-resistant material with a plurality of openings for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger used in gas turbine plants. According to Appellant, a conventional method used for producing such half-tubes or tube involves electrodischarge machining (EDM) for making a significant number of openings in a forged half-tubes or tube, which was known to be extremely cost-intensive, time-consuming, and problematic in terms of forming recast layers detrimental to soldering.

Although Appellant does not acknowledge that the claimed conventional lost wax investment (precision) casting method (corresponding to the claimed process steps) was known to be employed for forming such half-tubes or tube, Wilkinson, Wunder, or Ottenschlaeger, as explained by Chandley, teaches employing a conventional investment (precision) casting process to form a complex high temperature-resistant metallic material structure, including a tube having a plurality of openings, without using an

EDM step for forming the openings. Wilkinson, for example, teaches employing a conventional lost wax investment (precision) casting method to produce a unitary cast structure of a ceramic material comprising a hollow aerofoil member and a cooling air entry tube having a plurality of small apertures as a blade or vane structure for a gas turbine engine. Wunder teaches advantageously employing an investment (precision) casting method to cast a tubular heat exchanger shell body having a number of parts of different sizes and orientations, including protrusions, a long internal cylindrical bore, annular recesses, and a plurality of openings and passages. Ottenschlaeger teaches employing lost wax (precision) casting to produce pipe segments having projections with screw holes and openings in a cost efficient manner for their use as an exhaust gas pipe for charged multi-cylinder internal combustion engines, without any additional costs associated with making screw holes separately.

Given the usefulness of such conventional lost wax investment (precision) casting method in forming complex high temperature-resistant structures, including tubes having openings and protrusions, we concur with the Examiner that one of ordinary skill in the art would have been led to employ such conventional lost wax investment (precision) casting method corresponding to the claimed steps to form known half-tubes or a known tube of a metallic, high temperature-resistant material useful for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger, with a reasonable expectation of successfully casting such half-tubes or tube. *KSR*, 550 U.S. at 417 (quoting *Sakraida v. Ag Pro, Inc.*, 425 U.S. 273, 282 (1976)(“[W]hen a patent ‘simply arranges old elements with each performing the same function it had been known to perform’ and yields no

more than one would expect from such an arrangement, the combination is obvious.”)

Appellant contends that Wilkinson, Wunder, or Ottenschlaeger, as explained by Chandley, does not employ its conventional lost wax investment (precision) casting method to address the problem contemplated in Appellant’s Specification. In so contending, Appellant fails to consider his own admission that one of ordinary skill in the art was aware of the cost, time, and recast layer problems associated with a separate hole-making step, such as electrodischarge machining (EDM). Thus, as correctly found by the Examiner at page 5 through 7 of the Answer, one of ordinary skill in the art looking to avoid such cost, time, and possibly recast layer problems would have been led to employ the conventional lost wax investment (precision) casting method with a reasonable expectation of successfully solving such problems. As stated by the Examiner at page 5 of the Answer:

When there is a need or market pressure to solve the problems (to simplify the process and to reduce the processing cost) and there are a finite number of identified, predictable solution[s] (casting methods), a person of ordinary skill has good reason to pursue the known option (investment casting process). [See *KSR*, 550 U.S. at 421].

This is especially true in this situation since it would have been readily apparent to one of ordinary skill in the art from simple observation that the conventional lost wax investment (precision) casting method taught by Wilkinson, Wunder, or Ottenschlaeger, as explained by Chandley, does not suffer from the problems associated with electrodischarge machining (EDM). *In re Ludwig*, 353 F.2d 241, 244 (CCPA 1965).

In any event, the teachings of the prior art relied upon need not be combined for the reasons contemplated by Appellant as long as there is some reason to combine such teachings. *In re Beattie*, 974 F.2d 1309, 1312 (Fed. Cir. 1992) ("As long as some [reason,] motivation or suggestion to combine the references is provided by the prior art taken as a whole, the law does not require that the references be combined for the reasons contemplated by the inventor."); *KSR*, 550 U.S. at 419-420. Thus, we find no reversible error in determining that one of ordinary skill in the art would have been led to employ the conventional lost wax investment (precision) casting method taught by Wilkinson, Wunder, or Ottenschlaeger, as explained by Chandley, to form known half-tubes or known tube of a metallic, high temperature-resistant material useful for fabricating heat-exchanger tubes of a recuperative waste gas heat exchanger, with a reasonable expectation of successfully casting such half-tubes or tube with such conventional lost wax investment (precision) casting method.

Appellant also contends that Wilkinson, Wunder, or Ottenschlaeger, as explained by Chandley, does not teach forming the claimed half-tubes or tube with a myriad of holes as explained at page 2 of the Specification. However, as indicated *supra*, one of ordinary skill in the art would have reasonably expected that the conventional lost wax investment (precision) casting method taught by Wilkinson, Wunder, or Ottenschlaeger, as explained by Chandley, useful for forming complex high resistant metallic structures, including tubes having holes, is equally useful for forming the claimed half-tubes or tube having a plurality of openings. On this record, Appellant has not proffered any objective evidence to show that one of ordinary skill in the art would not have reasonably expected that such

conventional lost wax investment (precision) casting method is suitable for forming the claimed half-tubes or tube. Appellant's mere arguments in the Appeal Brief regarding the suitability of such conventional lost wax investment (precision) casting method in forming the claimed half-tubes or tube cannot take the place of objective evidence. *See, e.g., In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *In re Lindner*, 457 F.2d 506, 508 (CCPA 1972).

Appellant further contends that none of the prior art relied upon by the Examiner teaches or would have suggested the claimed post treatment feature. However, claim 9 recites its post treatment step as an optional step, i.e., "post-treating, *as necessary*, the openings passing through the surface of the one of (a) the half-tubes and (2) the tube by one of (a) spark erosion and (b) blasting with an abrasive blasting agent." (Emphasis added). This interpretation is consistent with page 7 of the Specification which requires employing the claimed post-treatment step only *if* such treatment is deemed necessary.

Accordingly, based on the totality of record, including due consideration of Appellant's arguments, we determine that the preponderance of evidence weighs most heavily in favor of obviousness regarding the subject matter defined by claims 9, 11 through 15, 17 through 21, and 26 within the meaning of 35 U.S.C. § 103.

## II. CLAIMS 10 AND 16

As to the § 103(a) rejections of claims 10 and 16, Appellant relies on the same arguments advanced in connection with the § 103(a) rejection of claims 9, 11 through 15, 17 through 21, and 26 as unpatentable over the

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combined teachings of the admitted prior art, either Wilkinson, Wunder or Ottenschlaeger, and Chandley (App. Br. 7-8).

Thus, for the same reasons set forth above and in the Answer, we determine that the preponderance of evidence weighs most heavily in favor of obviousness regarding the subject matter defined by claims 10 and 16 within the meaning of 35 U.S.C. § 103.

**ORDER**

In view of the foregoing, the decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

**AFFIRMED**

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